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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 09/823,839 | 03/30/2001 | Prashant B. Phatak | CY-0019 | 6118 |

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EXAMINER

GUERRERO, MARIA F

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| ART UNIT | PAPER NUMBER |
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2822

DATE MAILED: 03/20/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/823,839

Applicant(s)

PHATAK ET AL.

Examiner

Maria Guerrero

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 January 2003.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-5,7-11 and 13-22 is/are pending in the application.
- 4a) Of the above claim(s) 20-22 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-5,7-11,13-16,18 and 19 is/are rejected.
- 7) ☒ Claim(s) 17 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☒ The proposed drawing correction filed on 1-13-03 is: a) ☒ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Pri rity under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

1. This Office Action is in response to the Amendment filed January 13, 2003.

Claims 6 and 12 are canceled.

Claims 1-5, 7-11, and 13-22 are pending.

Election/Restrictions

2. Applicant's election with traverse of Group I (claims 1-19) in Paper No. 4 is acknowledged. The traversal is on the ground(s) that the process relied upon in the rejection is not materially different than Applicants' claimed processes. This is not found persuasive because the example stated in the restriction requirement is simply that, an example. There are other materially different processes that could be used to form the claimed product; the doped insulating film could be formed without varying the temperature. Also, the requirement for searching of the process claim does not necessitate a search in the product art, process and product art have gain separate stature in the office and would provide undue examining burden upon the Examiner.

The requirement is still deemed proper and is therefore made FINAL.

3. Claims 20-22 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected invention, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in Paper No. 4.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 1 and 4 are rejected under 35 U.S.C. 102(e) as being anticipated by Sugiarto et al. (U.S. 6,077,764).

Sugiarto et al. teaches varying a dopant supply rate for a doped insulating layer according to a variation in temperature of a substrate on which the doped insulating layer is being formed. Sugiarto et al. shows increasing the dopant supply rate as the substrate temperature increases (Fig. 2C, col. 10, lines 65-67, col. 11, lines 8-10, col. 12, lines 35-40, col. 13, lines 9-15). Sugiarto et al. teaches a high-density plasma deposition process may be employed to form the doped insulating layer (col. 10, lines 45-50).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1-3, 5, 7, and 9-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al. (U.S. 6,100,202) in view of Sugiarto et al. (U.S. 6,077,764).

Lin et al. teaches varying a dopant supply rate for a doped insulating layer, providing different dopant supply rate for different time periods, the doped insulating layer comprising phosphosilicate glass (col. 5, lines 60-65, col 15, lines 1-40). Lin et al. teaches increasing the dopant supply rate, etching a contact hole through the doped insulating layer, varying the dopant supply rate for an initial thickness of the insulating film, maintaining a constant dopant supply rate for a second period of time (Fig. 3-6, col. 5, lines 60-67, col. 9, lines 5-10, 25-40, col. 10, lines 25-45).

Furthermore, Lin et al. shows a forming a pre-metal dielectric layer having a thickness of from 500 to about 100 angstroms, the second deposition step forming a layer of thickness about 9000 angstroms, the total thickness of the doped silicate glass layer being from about 10000 to about 11000 angstroms (col. 7, lines 60-62, col. 10, lines 15-17, col. 15, lines 25-30).

Lin et al. does not specifically show increasing the dopant supply rate as the substrate temperature increases. However, Lin et al. shows the substrate temperature being from about 380 to 420 degrees C (col. 9, lines 64-67). In addition, Sugiarto et al.

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teaches increasing the dopant supply rate as the substrate temperature increases (Fig. 2C, col. 10, lines 65-67, col. 11, lines 8-10, col. 12, lines 35-40, col. 13, lines 9-15).

Since Lin et al. and Sugiarto et al. are both from the same field of endeavor of depositing doped insulating layers, the purpose disclosed by Sugiarto et al. would have been recognized in the pertinent art of Lin et al.

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to increase the dopant supply rate as the substrate temperature increases as taught Sugiarto et al. The modification would increase the doping efficiency (Sugiarto et al., col. 12, lines 35-40).

6. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al. (U.S. 6,100,202) and Sugiarto et al. (U.S. 6,077,764) as applied to claims 1-3, 5, 7, and 9-10 above, and further in view of Wang et al. (U.S. 4,376,672).

Regarding claim 8, the combination of Lin et al. and Sugiarto et al. does not specifically show the phosphorus concentration being greater than about 6% by weight. However, Wang et al. shows that phosphosilicate glass having a phosphorous concentration greater than 7% by weight is well known in the art. Wang et al. also shows typical etch results for phosphosilicate glass (col. 12, lines 5-20).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Lin et al. and Sugiarto et al. by including the teaching Wang et al. The modification would provide a doped insulating film having better control etching rate.

7. Claims 11,13-16 and 18-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin et al. (U.S. 6,100,202) in view of Barnes et al. (U.S. 6,521,546) and Wang et al. (U.S. 4,376,672).

Lin et al. teaches varying a dopant supply rate for a doped insulating layer, providing different dopant supply rate for different time periods, the doped insulating layer comprising phosphosilicate glass (col. 5, lines 60-65, col. 15, lines 1-40). Lin et al. teaches increasing the dopant supply rate, etching a contact hole through the doped insulating layer, varying the dopant supply rate for an initial thickness of the insulating film, maintaining a constant dopant supply rate for a second period of time (Fig. 3-6, col. 5, lines 60-67, col. 9, lines 5-10, 25-40, col. 10, lines 25-45).

Furthermore, Lin et al. shows a forming a pre-metal dielectric layer having a thickness of from 500 to about 100 angstroms, the second deposition step forming a layer of thickness about 9000 angstroms, the total thickness of the doped silicate glass layer being from about 10000 to about 11000 angstroms (col. 7, lines 60-62, col. 10, lines 15-17, col. 15, lines 25-30).

Lin et al. does not specifically show compensating for a temperature dopant gradient and the phosphorus concentration being greater than about 7% by weight. However, Barnes et al. teaches that the dopant concentration is dependent from the reaction temperature (col. 6, lines 40-55, col. 7, lines 14-18). Barnes et al. shows using a feed back-based temperature control system and a process gas control system that adjust the flow rates of the gas as necessary (col. 3, lines 15-23, 55-67).

Wang et al. shows that phosphosilicate glass having a phosphorous concentration greater than 7% by weight is well known in the art. Wang et al. also shows typical etch results for phosphosilicate glass (col. 12, lines 5-20).

Since Lin et al., Barnes et al. and Wang et al. are from the same field of endeavor of depositing doped insulating layers, the purpose disclosed by Barnes et al. and Wang et al. would have been recognized in the pertinent art of Lin et al.

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Lin et al. reference by including the teachings of Barnes et al. and Wang et al. The modification would provide a doped insulating film having better control etching rate.

Allowable Subject Matter

8. Claim 17 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: there is evidence indicating that the supply ratio varies from about 30% to 40.5 % is critical (Fig. 6, page 10).

Response to Arguments

9. Applicant's arguments with respect to claims 1-5, 7-11, 13-16, and 18-19 have been considered but are moot in view of the new ground(s) of rejection. The objection to the Specification has been withdrawn. The objections to the Drawings and the Oath/Declaration have been withdrawn.

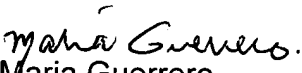
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Conclusion

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Maria Guerrero whose telephone number is 703-305-0162.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on 703-308-4905. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.


Maria Guerrero
Patent Examiner
March 18, 2003